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CE 6303
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Assignment – 4

(Q2)

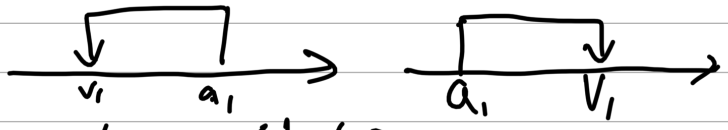
$$\{M0 :\Updownarrow (w0); M1 :\Uparrow (r0, w1); M2 :\Downarrow (r1, w0); M3 :\Updownarrow (r0)\}$$

March X: AF's, SAF's, TF's

fault	condition	Sensitization	detection	Comments.
AF	N/A	N/A	N/A	$M_1 + M_2$
SAF <↑/0>	N/A	M1 → tries to write '1'	M2 → reads '1' and expects '1'	N/A
SAF <↑/1>	N/A	M0 → tries to write '0'	M1 → reads '0' and expects '0'	M3 also detects.
TF <↑/0>	N/A	M0	M1	N/A
TF <↓/1>	N/A	M1	M2	N/A

(iv) Unlinked CF's

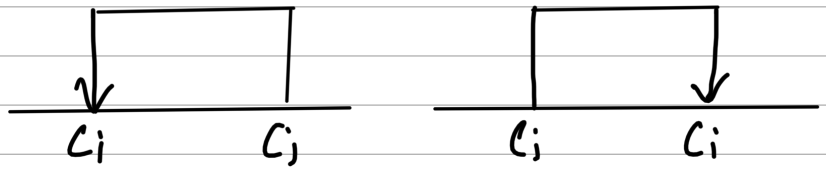
(a) CFid.



$\langle\uparrow,0\rangle, \langle\uparrow/1\rangle, \langle\downarrow/0\rangle, \langle\downarrow/1\rangle$

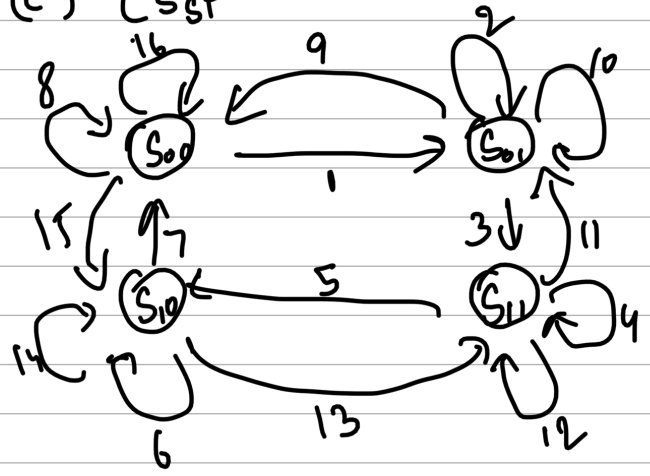
fault	condition	sensitization	detection	comments
$\langle\uparrow/0\rangle$	a-cell < V-cell	N/A	N/A	N/A
$\langle\uparrow/1\rangle$	a-cell < V-cell	M1	M2	N/A
$\langle\downarrow/0\rangle$	a-cell < V-cell	N/A	N/A	N/A
$\langle\downarrow/1\rangle$	a-cell < V-cell	M2	M3	N/A
$\langle\uparrow/0\rangle$	V-cell < a-cell	M1	M2	N/A
$\langle\uparrow/1\rangle$	V-cell < a-cell	N/A	N/A	N/A
$\langle\downarrow/0\rangle$	V-cell < a-cell	M1	M2	N/A
$\langle\downarrow/1\rangle$	V-cell < a-cell	N/A	N/A	N/A

(b) CFin



fault	condition	sensitization	detection	comments
$\langle\uparrow/\updownarrow\rangle$	j < i	M1	M1	N/A
$\langle\downarrow/\updownarrow\rangle$	j < i	M2	M3	N/A
$\langle\uparrow/\updownarrow\rangle$	i < j	M1	M2	N/A
$\langle\downarrow/\updownarrow\rangle$	i < j	M2	M2	N/A

(c) CSst



i < j

step	march	State	Operation	State
1	M0	S00	w0 i=0	S00
2	M0	S00	w0 j=0	S00
3	M1	S00	r0 i=0	S00
4	M1	S00	w1 i=1	S01
5	M1	S01	r0 j=0	S01
6	M1	S01	w1 i=1	S11
7	M2	S11	r1 i=1	S11
8	M2	S11	w0 i=0	S10
9	M2	S10	r0 j=0	S10
10	M2	S10	w0 j=0	S00
11	M3	S00	r0 i=0	S00
12	M3	S00	r0 j=0	S00

j < i

step	march	State	Operation	State
1	M0	S00	w0 j=0	S00
2	M0	S00	w0 i=0	S00
3	M1	S00	r0 j=0	S00
4	M1	S00	w1 j=1	S10
5	M1	S10	r0 i=0	S10
6	M1	S10	w1 i=1	S11
7	M2	S11	r1 j=1	S11
8	M2	S11	w0 j=0	S01
9	M2	S01	r0 i=0	S01
10	M2	S01	w0 i=0	S00
11	M3	S00	r0 j=0	S00
12	M3	S00	r0 i=0	S00

(V) linked CF's

consider $a_1 \rightarrow \langle \uparrow / 0 \rangle$
$a_2 \rightarrow \langle \uparrow / 1 \rangle$

fault	condition	Sensitizing	Detection	Conceal
$\langle \uparrow / 0 \rangle$ a_1 $\langle \uparrow / 1 \rangle$ a_2	a_2 - cell < a_1 cell < V cell	M_1 $a_2 \rightarrow 0 > 1$ V → 1 $a_1 \rightarrow 0 > 1$ V → 0	N/A	N/A

Conclusion:

March x test can detect AF, SAF, TF Unlinked CFs, but no linked CF.

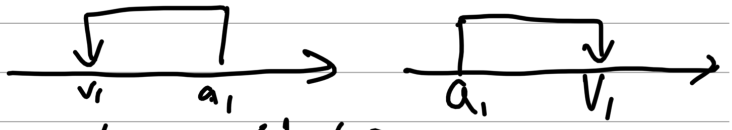
(Q3) $\{M0 : \Updownarrow (w0); M1 : \Uparrow (r0, w1, r1); M2 : \Downarrow (r1, w0, r0); M3 : \Updownarrow (r0)\}$

March Y: AF's, SAF's, TF's

fault	Condition	Sensitization	detection	Comments.
AF	N/A	N/A	N/A	$M_1 + M_2$
SAF $\langle \forall / 0 \rangle$	N/A	M1 → tries to write '1'	M1 → reads '1' and expects '1'	M2 also detects.
SAF $\langle \forall / 1 \rangle$	N/A	M2 → tries to write '0'	M2 → reads '0' and expects '0'	M3 also detects.
TF $\langle \uparrow / 0 \rangle$	N/A	M0	M1	N/A
TF $\langle \downarrow / 1 \rangle$	N/A	M1	M2	N/A

(iv) Unlinked CFs

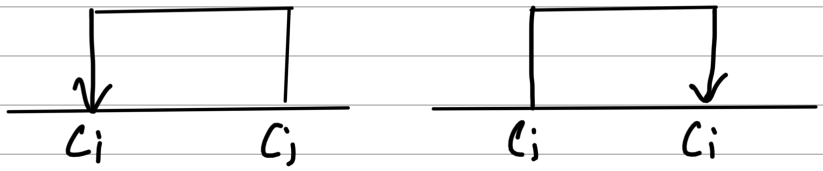
(a) CFid.



$\langle\uparrow/0\rangle, \langle\uparrow/1\rangle, \langle\downarrow/0\rangle, \langle\downarrow/1\rangle$

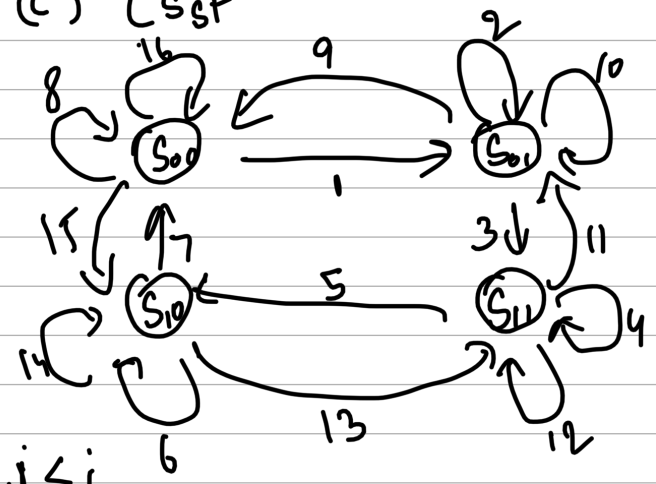
fault	condition	sensitization	detection	comments.
$\langle\uparrow/0\rangle$	a-cell < V-cell	N/A	N/A	N/A
$\langle\uparrow/1\rangle$	a-cell < V-cell	M_1 → read '0' write '1' to a-cell	M_1 → reads '0' But V-cell = '1'	N/A
$\langle\downarrow/0\rangle$	a-cell < V-cell	N/A	N/A	N/A
$\langle\downarrow/1\rangle$	a-cell < V-Sell	M2	M2	N/A
$\langle\uparrow/0\rangle$	V-cell < a-cell	M1	M1	N/A
$\langle\uparrow/1\rangle$	V-cell < a-cell	N/A	N/A	N/A
$\langle\downarrow/0\rangle$	V-cell < a-cell	M1	M1	N/A
$\langle\downarrow/1\rangle$	V-cell < a-cell	N/A	N/A	N/A

(b) CFin



fault	condition	sensitization	detection	comments
$\langle\uparrow/\updownarrow\rangle$	j < i	M1	M1	N/A
$\langle\downarrow/\updownarrow\rangle$	j < i	M2	M2	N/A
$\langle\uparrow/\updownarrow\rangle$	i < j	M1	M1	N/A
$\langle\downarrow/\updownarrow\rangle$	i < j	M2	M2	N/A

(c) CSst



j < i

step	mach	State	Operation	Stati
1	M0	S_{00}	w0 i=0	S_{00}
2	M0	S_{00}	w0 j=0	S_{00}
3	M1	S_{00}	r0 j=0	S_{00}
4	M1	S_{00}	wi j=1	S_{10}
5	M1	S_{10}	ri j=1	S_{10}
6	M1	S_{10}	r0 i=0	S_{10}
7	M1	S_{10}	w1 i=1	S_{11}
8	M1	S_{11}	ri i=1	S_{11}
9	M2	S_{11}	ri j=1	S_{11}
10	M2	S_{11}	w0 j=0	S_{01}
11	M2	S_{01}	r0 j=0	S_{01}
12	M2	S_{01}	ri i=1	S_{01}

i < j

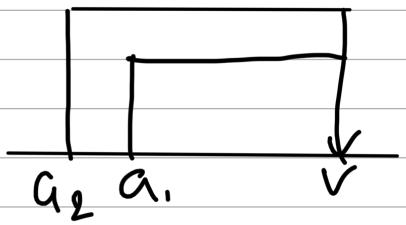
step	mach	State	Operation	Stati
1	M0	S_{00}	w0 i=0	S_{00}
2	M0	S_{00}	w0 j=0	S_{00}
3	M1	S_{00}	r0 i=0	S_{00}
4	M1	S_{00}	wi i=1	S_{01}
5	M1	S_{01}	ri i=1	S_{01}
6	M1	S_{01}	r0 j=0	S_{01}
7	M1	S_{01}	w1 j=1	S_{11}
8	M1	S_{11}	ri j=1	S_{11}
9	M2	S_{11}	ri i=1	S_{11}
10	M2	S_{11}	w0 i=0	S_{10}
11	M2	S_{10}	r0 i=0	S_{10}
12	M2	S_{10}	ri j=1	S_{10}
13	M2	S_{10}	w0 j=0	S_{00}
14	M2	S_{00}	r0 j=0	S_{00}
15	M3	S_{00}	r0 i=0	S_{00}
16	M3	S_{00}	r0 j=0	S_{00}

j < i

13	M2	S_{01}	w0 i=0	S_{00}
14	M2	S_{00}	r0 i=0	S_{00}
15	M3	S_{00}	r0 i=0	S_{00}
16	M3	S_{00}	r0 j=0	S_{00}

(V) linked CF's

consider $a_1 \rightarrow \langle \uparrow / 0 \rangle$
$a_2 \rightarrow \langle \uparrow / 1 \rangle$



fault	condition	sensitizing	Detection	Conceal
$\langle \uparrow / 0 \rangle$ a_1 $\langle \uparrow / 1 \rangle$ a_2	a_2 - cell $< a_1$ cell $< V$ cell	M_1 $a_2 \rightarrow 0 > 1$ $V \rightarrow 1$ $a_1 \rightarrow 0 > 1$ $V \rightarrow 0$	N/A	N/A

Conclusion:

March Y can detect AF, SAF, TF, Unlinked CF but cannot detect linked CF.

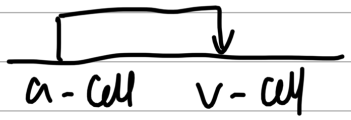
(Q1)

(i) Let us consider new fault model

Notation: $\langle w0/\uparrow \rangle, \langle w0/\downarrow \rangle, \langle w1/\uparrow \rangle, \langle w1/\downarrow \rangle, \langle r0/\uparrow \rangle, \langle r0/\downarrow \rangle$
$\langle r1/\uparrow \rangle, \langle r1/\downarrow \rangle$

Consider the following MARCH C- algorithm:

$\{ \updownarrow(w0); \uparrow(r0, w1); \uparrow(r1, w0); \downarrow(r0, w1); \downarrow(r1, w0); \updownarrow(r0) \}$



fault	Condition	Sensitization	detection	Comments.
$\langle w_0/\downarrow\rangle$	a-cell < V-cell	M2	M2	N/A
$\langle w_0/\uparrow\rangle$	a-cell < V-cell	M4	M5	N/A
$\langle w_1/\downarrow\rangle$	a-cell < V-cell	M3	M4	N/A
$\langle v_1/\uparrow\rangle$	a-cell < V-Sell	M1	M1	N/A
$\langle r_0/\downarrow\rangle$	a-cell < v-cell	M3	M4	N/A
$\langle r_0/\uparrow\rangle$	a-cell < v-cell	M1	M1	N/A
$\langle r_1/\downarrow\rangle$	a-cell < v-cell	M2	M2	N/A
$\langle r_1/\uparrow\rangle$	a-cell < V-cell	M4	M5	N/A

fault	Condition	Sensitization	detection	Comments.
$\langle w_0/\downarrow\rangle$	v-cell < -cell	M4	M4	N/A
$\langle w_0/\uparrow\rangle$	v-cell < a-cell	M2	M3	N/A
$\langle w_1/\downarrow\rangle$	v-cell < a-cell	M1	M2	N/A
$\langle v_1/\uparrow\rangle$	v-cell < a-Sell	M3	M3	N/A
$\langle r_0/\downarrow\rangle$	v-cell < a-cell	M1	M2	N/A
$\langle r_0/\uparrow\rangle$	v-cell < a-cell	M3	M3	N/A
$\langle r_1/\downarrow\rangle$	v-cell < a-cell	M4	M4	N/A
$\langle r_1/\uparrow\rangle$	v-cell < a-cell	M2	M3	N/A

(ii) To modify MATS+ algorithm we consider all the patterns possible except all zero's and all one's.

the we write all '1' to each word in memory followed by all '0' for each word in memory.

for each bit we write pattern with only one '1' and rest of them to be '0' and one '0' with rest of them to be '1'

for each word we read and verify the data.

for B=4.

write the following patterns.

(i) 0001
(ii) 0010
(iii) 0100
(iv) 1000

then we write all '1' and all '0' pattern.

writing one '1' to each.

⇒ bit 0 → 1000
bit 1 → 0100
bit 2 → 0010
bit 3 → 0001

next we write one '0' to each.

⇒ bit 0 → 0111
bit 1 → 1011
bit 2 → 1101
bit 3 → 1110

then we read the data and verify.